REMARKS

Claims 27 - 33 and 36 - 52 remain active in this application. No new matter has been introduced into the application.

This application is a division of U. S. Patent Application Serial Number 09/408,351 which was originally filed on September 29, 1999, (now U. S. Patent 6,221,780) and thus has been effectively pending for in excess of four years. Moreover, this Request for Reconsideration is in response to the ***sixth*** action on the merits of this application and the application was last amended concurrently with the filing of the ***second*** Request for Continued Examination, as required in support thereof. Further, but for the inclusion of the Cohen reference (cited on page 12 of the specification, as originally filed) the substance of the Examiner's actions has remained substantially unchanged (including explicit self-contradictory statements repeatedly brought to the Examiner's attention) since the filing of the Request for Continued Examination and including responses to remarks presented which are unsupported by the references relied upon. Accordingly, Supervisory review is respectfully requested under M.P.E.P. §707.02.

Claims 27, 31 - 33, 36 - 41, 43 - 46 and 49 - 52 have been rejected under 35 U.S.C. §103 as being unpatentable over Kawanoue et al. in view of the Cohen et al., claim 28 has been rejected under 35 U.S.C. §103 as being unpatentable over Kawanoue et al. in view of Cohen et al. and Lopatin et al., claims 29 - 30 have been rejected under 35 U.S.C. §103 as being unpatentable over Kawanoue et al. in view of Cohen et al., Lopatin et al. and Yew et al., claims 42 and 47 - 48 have been rejected under 35 U.S.C. §103 as being unpatentable over Kawanoue et al. in view of Cohen et

al. and Usami. All of these grounds of rejection are respectfully traversed for the reasons of record, which are hereby fully incorporated by reference, and the further remarks below.

The invention is directed to an integrated circuit using a flowable oxide, a material of a recognized class of materials having a low dielectric constant which may be used to reduce capacitance between conductors. However, use of this class of materials in integrated circuits presents problems in that the flowable oxide material is characterized by having strained bridging oxygen atoms and are readily attacked by numerous chemicals (including lithographic developers) and/or subject to rapidly propagating cracks resulting from relatively minor physical damage. See page 2, lines 16 - 30 and page 3, line 29, to page 4, line 9, of the present specification.

The present specification acknowledges that it is known to provide protective layers over flowable oxide materials but notes that some protective materials have been found to cause additional problems while *deposited* SiO_2 (disclosed by Cohen et al., applied against the claims by the Examiner and discussed in the present specification at page 4, line 28, to page 5, line 22) or other known dielectrics necessarily have a significant thickness (for film integrity/continuity and/or adhesion - 1000Å in Cohen et al.) to provide adequate protection and a sufficiently higher dielectric constant which, in combination, significantly compromise the reduced capacitance sought to be derived from the lower dielectric constant of the flowable oxide materials.

Given this background information concerning the use of flowable oxide materials in integrated circuits at the time the invention was made, the invention provides a protective layer of SiO_2 which may be arbitrarily thin but is of good integrity, continuity

and adhesion (and which provides enhanced adhesion for other protective layers) by the simple expedient of oxidizing the surface of the flowable oxide to form SiO_2. It can be readily appreciated in light of the present disclosure that oxidization of a surface of a material deficient in oxygen will provide a film of good integrity and adhesion while being formed arbitrarily thin since SiO_2 will be readily and preferentially formed (and closely bonded) wherever oxygen deficient flowable oxide material is exposed. This distinctive feature of the invention is recited in the independent claims by the language:

> "a primary protective layer on said sidewalls of said flowable oxide insulator layer, said primary protective layer *being a thin oxidized surface layer of said flowable oxide insulator material* on said sidewalls within said trough, *said thin surface layer preventing the exposure of said flowable oxide insulator layer to moisture and lithographic resist developers, said primary protective layer being substantially impervious to copper extrusion*" (claim 27 - emphasis added),

and

> "said thin protective layer *being an oxidized surface layer of said flowable oxide insulator* that is *resistant to moisture and lithographic resist developers*" (claim 38 - emphasis added).

The Examiner continues to assert that layer 161 of Kawanoue et al. is a flowable oxide layer, which it clearly is not, as has been repeatedly pointed out, and then admits that Kawanoue et al. does not, in fact, teach or suggest a flowable oxide layer and relies upon Cohen et al. for such a teaching; suggesting that substitution of a flowable oxide for SiO_2 of Kawanoue

et al. would be obvious to obtain enhanced gap-filling. While such an assertion may be true, it does not address the problems known to be associated with the use of a flowable oxide in an environment of an integrated circuit as discussed above and as solved by the invention, as explicitly recited in the claims as demonstrated above. Cohen et al. refers, at column 3, line 62 to column 4, line 15, to capping of the flowable oxide, after curing in the presence of hydrogen, with an insulator such as silicon oxide or silicon nitride which is "put onto" the surface of the flowable oxide and assists in developing "good film thickness" which is sufficient to improve planarity over conductors sufficient to reduce required polishing of the dielectric. In comparison, the flowable oxide "insulation layer" is preferably of a thickness of only "500Å to 1 micron". The Examiner makes no reference in the statement of the rejections to capping or provision of an interlayer dielectric of silicon oxide "put onto" the flowable oxide layer, much less the silicon oxide formed by oxidation of the surface of the flowable oxide as recited in the claims.

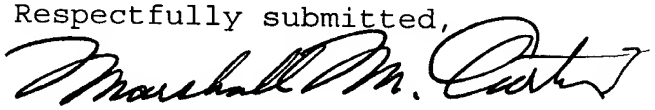
If the Examiner has made any attempt to answer the above claim recitations (which is not apparent), no particular passage of Cohen et al. is indicated by the Examiner as being relied upon for such teaching or suggestion. For this reason, it is particularly clear that the Examiner has not made and cannot make a *prima facie* demonstration of obviousness of any claim in the application and has failed to do so over an extended sequence of office actions. Moreover, the Examiner indicates that no patentable weight is given to claims 49 and 51 which are asserted to be product-by-process claims and it may be that the Examiner has applied a similar rationale to other claims such as independent claims 27 and 38 without so stating. However, it is clear that the above recitations are clearly structural

and not product-by-process recitations and even if such recitations were so construed, structural differentiation of the resulting product from the prior art is amply supplied throughout the specification as originally filed. In any case, the Examiner's position in regard to product-by-process recitations reflects an improper analysis in regard to making a *prima facie* demonstration of obviousness to shift the burden of showing a distinction, particularly since the distinction from Cohen et al., in particular, is discussed at length throughout the present application. Particularly under the present circumstances, the Examiner may not properly fail to give patentable weight or otherwise tacitly ignore (or misconstrue contrary to the explicit statements of the specification, as has been done in the prosecution of this application, for example, by asserting that SiO_2 can be made "flowable" if raised to a sufficient temperature) any explicit recitation of the claims. Further, the Examiner has not asserted that this deficiency in the teachings of Kawanoue et al. and Cohen et al. (which, it is respectfully submitted, the Examiner gives little, if any, indication of recognizing) is in any way mitigated by the teachings or suggestions of Lopatin et al., Yew et al. and/or Usami, taken separately or in any combination. Accordingly, it is respectfully submitted that the various grounds of rejection contained in the present office action are clearly in error and utterly insufficient to even demonstrate proper consideration of the explicit recitations of the claims, much less providing a *prima facie* demonstration of the propriety of any asserted ground of rejection. (It is also respectfully submitted that the finality of the present action is premature for that reason.) Therefore, reconsideration and withdrawal of all grounds of rejection is respectfully requested.

Since all rejections, objections and requirements contained in the outstanding official action have been fully answered and shown to be in error and/or inapplicable to the present claims, it is respectfully submitted that reconsideration is now in order under the provisions of 37 C.F.R. §1.111(b) and such reconsideration is respectfully requested. Upon reconsideration, it is also respectfully submitted that this application is in condition for allowance and such action is therefore respectfully requested.

If an extension of time is required for this response to be considered as being timely filed, a conditional petition is hereby made for such extension of time. Please charge any deficiencies in fees and credit any overpayment of fees to Deposit Account No. 09-0458 of International Business Machines corporation (E. Fishkill).

Respectfully submitted,



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